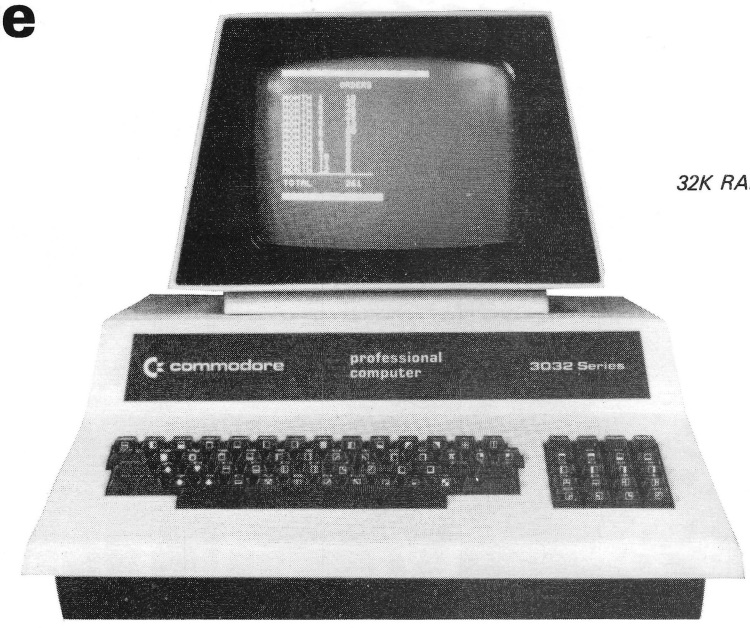
The Commodore PET

Professional Computer System

commodore

The Commodore PET Range



32K RAM PET Computer

The Commodore PET is a multi-function desk top computer, designed to utilise the latest micro-processor technology to provide a sophisticated data processing facility that is superb value for money. The PET is made up of a number of sub systems, which include a visual display unit (VDU), an operator keyboard and the computer logic board. In addition a versatile 'BUS' is provided to enable instructions or data to pass between the PET computer and its peripherals. Although the PET is a micro computer system, its computing power is quite outstanding, due largely to the unique organisation of its memory.

THE UNIQUE PET MEMORY

The memory of the PET must be considered in terms of its programmable user memory and an additional pre-programmed memory which is exclusively for controlling the operation of the computer, (operating system) and for language interpretation. The normal high level language of the PET is EXTENDED BASIC. The user memory is a random access memory device (RAM) with an extendable capacity of 8K to 32K 8-bit words.

The maximum mainframe memory available on a PET system **not** including peripheral data storage devices is therefore:
User Memory:
32K Bytes RAM
Operating System:
5K Bytes ROM
Basic Language Interpreter:
8K Bytes ROM
Machine Code Monitor:
1K Bytes ROM.
Because the operating system and language interpreter are pre-programmed ROM's, *a PET computer is fully operational immediately it is switched on.* This is unlike most other micro computers which require software programs or bootstrap routines as part of the start up process with a corresponding decrease in the amount of actual RAM memory available to the user.

WHICH PET?

PET computers are available with 3 RAM configurations: 8K, 16K and 32K. All 3 machines have a typewriter style keyboard with all normal alphanumerics plus PET graphic symbols.

In addition the 8K machine is available with a smaller "office calculator" type of keyboard and a built in cassette deck. Consequently the machine has "stand alone" capabilities for program and data storage, and is especially suitable for educational and laboratory applications.

All PETs are "plug compatible" with Commodore's Floppy Disk Unit, Tractor Feed Printer and external cassette deck — no additional interfacing circuitry or I/O boards are required.

The 8K PET with "office calculator" style keyboard and integral cassette deck can be used as a "stand alone" system.

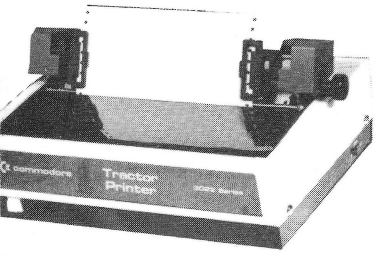
A complete set of peripherals from
Tractor Feed Printer and Cassette U

DUAL DRIVE FLOPPY DISK

This new data storage peripheral represents the latest disk technology by combining extremely large data storage capability with excellent file management. Because the PET disk is an 'intelligent' device, it does not require the use of 'RAM' memory in its operation. It is therefore easier and more efficient to use than most disk systems currently available. A unique feature of the PET disk is its operating system, which enables a programme to read or write data in the background while simultaneously allowing the transfer of data along the IEEE bus to the PET memory. The Floppy Disk is a reliable, low cost, high speed data store, ideal for permanent bulk data storage. Due to the latest technological advances incorporated in the disk logic, a total of 343K bytes can be stored in two standard 5¼" diskettes, without having to use double density or double tracking techniques. This is largely due to the use of two integral microprocessors and 15 memory I.C's. Only two connections are necessary, a power cable and a PET to IEEE cable.

TRACTOR FEED PRINTER

The PET printer enables processed data to be presented in such a way that the user can obtain a hard copy of alpha numeric and graphic symbols. Such data can be formatted and tabulated to suit any practical requirement. The tractor feed capability relates to the sprocket drive enabling the paper to be positioned with digital



Commodore: Floppy Disk Unit, Unit.

precision under command from the PET. Apart from the general requirement of systems and data logging, the tractor feed printer enables the PET to handle many other types of application, including business forms, statements and invoices, customised printing, copy printing, etc. with control of print width, decimal position, leading and trailing zeros, left and right margin control, print normalisation and lines per page with up to four copies.

THE CASSETTE DECK

All PETs can be programmed by means of the magnetic cassette deck, which is either integral with the computer on the small version, or used externally on the larger keyboard system. If required more than one cassette deck can be used, allowing the computer to edit data according to programming requirements. It uses standard audio cassette tapes available in stores everywhere. The C2N features a Double Save technique at different audio frequencies ensuring error correction. The verify command feature provides a check as to the correct saving of programs. Data transfer rates are of the order of 30 bytes/sec, C60 cassettes normally provide data storage of around 100,000 bytes (8 bit words).
For many applications this relatively low speed of data transfer is too slow and as such an additional high speed data store can be added in the form of a 'Floppy Disk'.

THE PET VIDEO MONITOR

The PET monitor provides a green, very clear display of all data entered through the keyboard as a matrix of 40 x 25 characters. In addition the computer can display on the monitor all of the keyboard symbols line by line, or as a matrix. As such the PET can be used to generate GRAPHICS plus ALPHA NUMERICS. For the user this means the PET micro computer can be used for many applications as well as calculation, i.e. as a *sophisticated data processing system.* With applications ranging from business uses, laboratory analysis, Computer Aided Design, engineering, Computer Assisted Learning, computer studies — even personal education and entertainment.

PET SYSTEMS

Computer systems, if designed properly, should be intelligent, inexpensive, easy to use and reliable. Commodore PET systems meet all these conditions. A typical system usually requires:—

A PET micro computer
A bulk data store (floppy disk)
An output device, such as a printer
Software

Such a combination can be used in many hundreds of applications — here are just a few possibilities:—

Stock Control
Word Processing
Accounting
Payroll
Quotations
Information Retreival (Electronic Filing)
Spectroscopy/Data Logging/Instrument Control
Process Control
Sequence and Timing Control.
Engineering Design/ Scheduled Maintenance.

SOFTWARE

A feature of the PET system is the availability of hundreds of programmes written exclusively for PET and supplied on inexpensive magnetic cassettes. This enormous software library has been written for all areas of interest including Science, Engineering, Business, Financial, Maths, Games, etc.

A comprehensive description of Commodore's own cassette programs can be found in the booklet:- **'Petpack Master Library from Commodore'.**

Also available are a series of excellent disk based programs for business, construction and building services, and the engineering industry. Further details on these programs are available in the booklets:- **'Business Software from Commodore'** and **'Approved Products for the Commodore PET'.**

COMPUTER LANGUAGE

The decision as to which programming language to use with a Commodore PET system depends entirely on the intended application, or required speed of data transfer. The usual language is EXTENDED BASIC with its logical and very powerful instruction set. The resident operating system ensures that the PET is always fully programmed to receive instructions in this language. For scientific or laboratory use the PET has a comprehensive set of scientific functions making it far superior to the best programmable calculators. In addition the PET can, when required, be programmed in MACHINE CODE which, because of its inherent speed, can be used when faster data transfer is required.

Commodore has produced its own 6502 Assembler Development System to assist machine code programmers. Full details are given in the booklet:- **'Petpack Master Library from Commodore'.**

FORTH and PILOT, intended primarily for Computer Assisted Learning applications, are also available. Also in the Master Library is Commodore's LISP — a language used for research into the field of artificial intelligence which lends itself for many relational database applications. Other languages including PASCAL are under development.

INTERFACES

An interface is a device or peripheral designed to accept data in one format and transmit data in another. In that all computers are designed to accept and transmit data in specific codes, so the PET also requires data to be presented in a correct and logical format.

Two possibilities exist, the PET **IEEE-488 BUS** and an **8-bit parallel user port.** These two methods have been chosen in that they together represent the most powerful combination of data transfer formats available.

The IEEE-488 bus is a two way data highway — that can be extended by simple bus-cable extensions, such that up to 15 separate IEEE-488 devices or peripherals can be addressed by the computer.

The user port is an additional interface that does not require IEEE-488 protocol encoded data, but simply allows the use of any peripheral or device that can function with a simple 8-bit parallel code to be interfaced to the PET. Data can be transfered in either direction. For convenience, the user port can be addressed with a 2 line handshake, so ensuring that data is properly received and transmitted by the computer.

PET COMPATIBLE INTERFACES

The IEEE-488 bus is accepted world-wide as an industry standard for the transmission of digital information.

Consequently the PET is directly compatible with hundreds of laboratory instruments, such as DVMs, synthesizers, data loggers, auto analysers, etc. In addition the 8-bit parallel user port is an ideal general interface port.

A complete series of specialist interfaces are also available, allowing the PET to "talk" to a wide range of non IEEE-488 devices.

These include:—
TV/Video Monitor Interface
IEEE-488 — RS232C and TTY interfaces.
IEEE 488 X-Y analogue plotter interface
Relay closure unit, 16 channel.
D-A convertor, 8 channel
A-D convertor, 16 channel.
Data acquisition interface, 8 bit, 8 channel.
Electronic balance interface.
Software/Hardware package enabling PET to function as an intelligent RS232 terminal.

Further details on the above are available in the booklet:- **'Approved Products for the Commodore PET'.**

DOCUMENTATION

The PET Computer, Floppy Disk Unit and Printer are all accompanied by comprehensive instruction manuals. In addition the machine code programmer and digital electronic engineer will find it useful to reference the excellent HARDWARE and PROGRAMMING manuals for Commodore's own MOS technology 6500 series microprocessor.
As the PET has become an "industry standard" there are numerous additional sources of information on specialist areas of interest including: 'Hands on Basic with a PET' — McGraw Hill; 'PET Workbooks' — TIS; '6502 Assembly Language Programming' — Adam Osborne; "6502 — Applications Manual' — Sybex; and 'PET Revealed' — Computabits.

COMMODORE SUPPORT

Commodore has been in business for over 20 years, and has acquired a powerful stake in the latest electronic technology including its own 'silicon chip' design and production company (MOS Technology).

In Britain PET is supported by a network of 200 Official Dealers who offer technical support, installation and maintenance services.

Commodore runs a comprehensive series of training courses and seminars on the PET computer. In addition the Commodore PET Users Club Newsletter provides a regular forum for the exchange of information amongs PET Users.

Further information is available from the Commodore Information Centre, 360 Euston Road, London NW1. Tel: (01) 388 1358.

Specifications

PET COMPUTER

Dimensions: 16½" wide by 18½" deep. 14" overall height.
Weight: 44lbs.

MEMORY

Random Access Memory 8K, 16K and 32K as per model number. Expandable to 32K bytes.

Read Only Memory (operating system resident in the computer):
13K bytes
8K BASIC interpreter
5K Operating system
1K Machine code monitor

Video Display Unit: 9" enclosed black and green, high resolution CRT.
1000 character display, arranged 40 columns by 25 lines.
8 x 8 dot matrix for characters and continuous graphics.
Automatic scrolling from bottom of screen.
Winking cursor with full motion control.
Reverse field on all characters (white on black or black on white).
64 standard ASCII characters;
64 graphic characters. Lower case letters are available by use of a POKE command.

KEYBOARD

73 keys.
all 64 ASCII characters available without shift. Calculator style numeric keypad.
All 64 graphic and reverse field characters accessible from keyboard (with shift).

Screen Control: Home and clear
Editing: Character insertion and deletion.

OPERATING SYSTEM

Powerful and "user friendly" screen editor.
Machine language accessibility
File management in operating system.
Cursor control, reverse field and graphics under simple BASIC control.
Real time clock can be accessed from BASIC.

File management in operating system can be handled by BASIC or from machine code.

INPUT/OUTPUT

All other I/O supported through IEEE-488 instrument interface which allows for multiple intelligent peripherals.
All I/O automatically managed by operating system software.
Single character I/O with GET command.
Easy screen line-edit capabilty.
allows for BASIC expansion with up to 12 intelligent peripherals.
Direct sensing of key press available.

BASIC INTERPRETER

Expanded 8K BASIC;
Upward expansion from current popular BASIC language.
Strings, integers and multiple dimension arrays.
10 significant digits; floating point numbers.
Memory access through PEEK and POKE commands.
Machine code subroutines can be called up from BASIC with (SYS) and (USR).
Pseudo random number generator

DUAL DRIVE FLOPPY DISK UNIT 3040

Microcomputer system devices
Controller
6504 microprocessor
6530 I/O RAM, and 1K ROM software.
6316 2K ROM for encoding and decoding disk data.
6522 I/O and interval timers
File interface.
6502 microprocessor.
(2) 6532 RAM, I/O, interval timers.
(2) 6332 4K ROM each (total 8K disk operating system). Shared RAM.
(8) 1K x 4 bit static RAM (total 4K bytes).

Disk Drives: (2) Shugart Associates SA390 drives standard minifloppy (5¼" disk).
Activity LEDs light when a file is open on that drive.
Error LED indicates command or data error.

Packaging
18 gauge all steel cabinet.
Dimensions: Width: 15", depth: 14.35", height: 6.5".
Cover hinges from base for servicing.
Weight: 28lbs.

Diskette Organisation
Formatting is by the drive itself — any mini-floppy diskette may be used.
35 concentric tracks.
Constant density recording on each track varying number of sectors per track:— Innermost: 17; outermost: 21
176640 bytes on a single side. Track Track 18 used for directory.
171520 bytes for user storage.
Soft-sectoring.

Data Interface
IEEE-488.
Standard 24-pin stacking connector.
Device 8-15 by jumper option.
Full listener-talker recognises secondary addressing.

Floppy Disk Commands (summary)
LOAD program
SAVE program
VERIFY program
OPEN datafile (up to 5)
PRINT to data file
CLOSE data file
VALIDATE disk
DUPLICATE disk
COPY program or data file (allows data files to be concatenated)
RENAME disk
SCRACTH unwanted file
examin ERROR CHANNEL

Advanced Disk Commands (summary)
BLOCK-READ
BLOCK-WRITE
BLOCK-EXECUTE
BLOCK-POINTER
BLOCK-ALLOCATE
BLOCK-FREE
memory write
memory read
memory execute
USER

TRACTOR FEED PRINTER 3022

Microcomputer System Devices
6504 Microprocessor
6532 I/O RAM, interval timer (2)
6332 4K x 8 ROM

Printer Mechanism:
Tractor feed
Epson DH-70 print head.
Dot matrix — 7 x 6 — 80 columns per line.
Impact print — original plus 3 copies.
Print rate is 75 LPM (93 CPS).
Programmable line spacing.
Forms: 8.5 + plus .5+ x 2 (sprocket margins).
Pin to pin distance:
.5+ Longitudinally
9.0+ Laterally
5/32+ Diameter

Packaging:
18 gauge all steel cabinet.
Dimensions: width: 17", depth: 18", height: 6½".
Forms enter from rear or bottom of cabinet.
Weight: 18 lbs.

Data Interface:
IEEE-488
Standard 24-pin stacking connector.
Device 4-11 by jumper option.
Listener only.
Recognizes secondary addressing.

Character Set:
Upper Case ASCII
Lower case ASCII
PET Graphics

Control Characters:
- Enhance printing (doubles size)
★ Enable automatic line count and paging
- Page eject
- Print reverse field
- Overprint a line
- Switch to lower case character set
- Print programmable character

IEEE Secondary Address Commands
- Print data exactly as received
- Accept characters as a format
- Edit data to format
- Alter number of lines per page
- Enable diagnostic messages to print
- Accept data for programmable character
- Alter paper advance per line feed

Data Formatting Capability
- Field width and decimal position specified
- Leading or trailing sign
- Fixed or floating dollar sign
- Forced leading zeros
- Literal characters always printed
- Alpha fields left justified

Diagnostic Messages
- Can be turned on when desired
- Print on paper
- Describe problems with format and data.

MAGNETIC CASSETTE UNIT C2N

Specifications:
Fast Commodore designed redundant-recording scheme, assuring reliable program and data storage. Cassette drive designed by Commodore for high reliability of recording and data retention.
High noise immunity, error detection and correction.
Named tape files.
Verify function checks program accuracy.

TAPE COMMANDS (summary)
LOAD program
SAVE program
VERIFY program
OPEN data file
PRINT to data file
CLOSE data file

Commodore's policy is one of continuous improvement and the right to change models, specifications and prices at any time without notice is reserved.

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